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Interagency Shoreline Management Consensus Document

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FINAL REPORT TO
VIRGINIA COASTAL PROGRAM
DEPARTMENT OF ENVIRONMENTAL QUALITY

SUBMITTED BY
THE CENTER FOR COASTAL RESOURCES MANAGEMENT
VIRGINIA INSTITUTE OF MARINE SCIENCE
COLLEGE OF WILLIAM AND MARY
GLOUCESTER POINT VIRGINIA

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Introduction

There are concerns in the general public and regulatory and environmental advisory agencies regarding the apparent inconsistent and /or contradictory guidance offered to property owners regarding shoreline management in Virginia. There has been a growing interest among the agencies that manage, or otherwise have a role in shoreline management, to develop a Virginia perspective on the issue. This project to develop a consensus position from a VIMS perspective, with funding from the Virginia Coastal Program, may serve as the initiation of an effort to develop consensus guidance on shoreline management that integrates the issues and concerns extant in the various independent management programs in Virginia.

Setting priorities for the preferred approaches to shoreline management in Virginia cannot be effective if developed in a vacuum. To be effective the effort needs to include consideration of a review of existing guidance and input from personnel representing other agencies that have a role in shoreline management. To develop the Virginia perspective representation should include the following core agencies: Department of Conservation and Recreation, Division of Chesapeake Bay Local Assistance and Shoreline Erosion Advisory Service, Virginia Marine Resources Commission, local governments and the Virginia Institute of Marine Science. From both a narrow and broad perspective, the review needs to reflect both the literature produced by VIMS and others (codified guidance), and engage personnel from VIMS as well as other agencies. The review of existing guidance creates an opportunity to confirm the relevance of the information given current scientific understanding as well as "mining" the guidance for existing rationale regarding shoreline decision-making. And the inclusion of others in the shoreline management arena allows for the development of agreement in the proper approaches to shoreline management in Virginia. The first step in working on a consensus for Virginia requires that each involved group have, or develop their own consensus.

At issue are those activities occurring along Virginia's shorelines proposed to address erosion. Most of these proposed activities result in direct or indirect effects on Virginia marine resources (tidal wetlands and subaqueous lands) requiring the submittal of an application for a permit. VIMS mandated involvement in shoreline management originate from § 28.2-1100 of the Code of Virginia directing the Institute to conduct research and provide advise on marine issues including tidal erosion, and from the Tidal Wetlands Act (§ 28.2-1301of the code of Virginia). As part of the permit process, staff from the VIMS Wetlands Advisory Group (WAG) visit virtually every location to provide an environmental assessment to the regulatory and advisory agencies. The VIMS role in the permit process and research activities molds the agencies' perspective on shoreline management issues.

The VIMS consensus was developed through a series of five meetings of the VIMS-WAG with participation from the Comprehensive Coastal Inventory (CCI) and National Estuarine Research Reserve Virginia (NERRVA) and Shoreline Processes staff. The group reviewed shoreline management guidance and shoreline inventory information, identified various combinations of riparian and littoral conditions and the range of shoreline practices found in Virginia. Regulatory guidance and other scientific literature were considered in the process. Several of the most pertinent guidance documents are:

> **Wetlands Guidelines.** Developed Pursuant to Chapter 13 of Title 28.2, Code of Virginia. Prepared by the Virginia Institute of Marine Science and the Virginia Marine Resources Commission. Reprinted 1993.Virginia Wetlands Guidelines
>
> **Coastal Primary Sand Dunes/Beaches Guidelines.** Guidelines for the Permitting of Activities Which Encroach into Coastal Primary Sand Dunes/Beaches. Developed Pursuant to Chapter 14 of Title 28.2, Code of Virginia, effective September 26, 1980. Issued by the Virginia Marine Resources Commission. Reprinted September 1993
>
> **Subaqueous Guidelines.** Developed pursuant to Chapter 12 of Title 28.2, Code of Virginia. Issued by the Virginia Marine Resources Commission. Reprinted September 1993.
>
> **Shoreline Management in Chesapeake Bay**. C. Scott Hardaway, Jr. and Robert J. Byrne. 1999.

Based on scientific understanding, permit review operational procedures, existing guidance and best professional judgment absent scientific data, the group generated several different elements that reflect group consensus regarding shoreline management. The elements separately, and cumulatively, provide a certain level of predictability in the likely outcome of a shoreline application review by the Wetlands Program staff. However, the elements are necessarily general, given the continuum of shoreline physical and biotic factors and gaps in scientific knowledge regarding certain functions associated with those factors. Thus the elements are not intended to supplant the role of site-specific observations and data in shoreline assessments.

The elements, described in detail in the succeeding sections are:

- Preferred Order for Shoreline Management Approaches
- Preferred Order for Shoreline Habitat Protection
- Erosion-Recession Matrix

This report, in draft form, has been provided to personnel in VMRC and DCR to garner input. The input may be used to identify concurrence and divergence in opinion and approaches regarding shoreline management.

Consensus Building Process

The process of assessing a shoreline for purposes of determining the necessity of action to protect against erosion, and the preferred structure and placement, from an environmental perspective is very complex. The application review process necessitates three analytical processes: 1) the determination of the need, or rationale, for shoreline protection, 2) the assessment of the direct, secondary and cumulative impacts of the proposed activity, and 3) the identification of possible preferred alternatives that would reduce adverse environmental impacts or increase beneficial outcomes. Thus the process requires and incorporates information on agents of erosion and indicators of erosion, as well as presence and condition of shoreline habitats.

In the first meetings the group developed a comprehensive list of those factors that may be taken into account during the shoreline application review process. Most of the factors reflect on the ecological setting of the proposed activity. While the WAG does not "engineer" structures as part of the review process, some consideration is given to the likelihood of the requested activity providing the desired outcome. In other words, will the structure work in the proposed location and with the specified construction details. These concerns reflect guidance on minimizing cumulative impacts associated with replacement and/or additional activities by avoiding the implementation of an improperly designed project. The WAG relies on the *Shoreline Development BMP's* (VMRC, 1999), *Shoreline Management in Chesapeake Bay* (Hardaway and Byrne, 1999) and others for information on structural issues.

The following list represents all those factors that play into the consideration of VIMS best technical advice regarding the most appropriate structure and location for erosion control based upon our understanding of water quality, physical factors and habitat. The original "laundry" list is shown below.

Shoreline review elements

Land Use/ Cover: the general setting
Riparian Use: the terrestrial setting right at the shoreline
Riparian cover: terrestrial vegetation along the shoreline
Bank height
Bank stability: slumping, gullies, bare, vegetated
Bank slope: vertical, flat, etc.
Erosive forces: a combination of elements
Wetland habitat: vegetated, nonvegetated, community type
Structures at risk: includes houses, bulkheads, etc.
Near shore habitat: SAV, shellfish, sand bars
Near shore slope: gradual or steep slope
Shoreline fetch: largest distance to land
Shoreline orientation
Adjacent shoreline risk: comes into consideration for assessing proposed actions
Shoreline recession: long-term change
Sediment Source/ Soil composition: sandy material, littoral drift

The next step was to identify criteria and/or parameters for the shoreline elements. In the interest of using the consensus building process to maximize the development of useful decision-making tools, we concurrently reviewed existing shoreline inventory data (See Appendix A for CCI data tables). We wanted to identify those elements that are available in GIS format that could support a web-based shoreline decision-making tool. The idea would be to eventually develop an interactive map that allows property owners to locate their property and get information regarding the ecology and erosion conditions of the site. The information would include a preliminary finding of the necessity for shoreline protection from a VIMS perspective.

In this list we have identified parameters for those elements for which data is available from the shoreline inventory (GIS elements: existing). There are additional elements that are used in the WAG permit review for which data is not available from the inventory (Observed elements). There are a couple elements (GIS elements: proposed) that have been proposed for development at VIMS. These elements would provide analytical information for the purpose of assessing shoreline condition. (A discussion on the proposed elements can be found in the section titled Erosion- Shoreline Change Matrix, near the end of this report).

GIS Elements: Existing

Land Use/ Land Cover
(Riparian condition)

Bank height:	< less than 5 feet 5 to 10 10 to 30 > 30
Bank stability:	stable (vegetated, no slumping) unstable (exposed, slumping, undercut)
Wetland:	vegetation present absent
Beach	Present Absent
Near shore habitat	SAV No SAV

GIS Elements: Proposed

Integrated Erosion
(Fetch, bathymetry, orientation, compass rose)
Shoreline recession

Observed Elements
Anthropogenic: structures and fastland at risk
Sediment source/ composition
Indication of littoral drift
Riparian Cover (%)
Adjacent shoreline risk

Near shore habitat

Once having identified the elements, the group started the work of identifying sets of conditions that are indicative of Virginia shoreline as described using those elements. Unfortunately, this approach yielded a very large possible number of combinations (each of which a participant could recall and describe an actual example). And rather than provide an opportunity to define a set of "typical" shoreline conditions upon which to build consensus, this circumstance resulted in divergence of opinion. We changed our approach to develop two priority lists; 1) for use of shoreline approaches and 2) protection of shoreline habitats. This approach is analogous to the Maryland effort published recently in the *Shore Erosion Control Guidelines* (date unknown).

Preferred order of Shoreline Management Approaches

Guidance documents, such as the Wetlands Guidelines and the *Shoreline Management in Chesapeake Bay* were specifically reviewed to check for existing shoreline management preferences. The Wetlands Guidelines provide general rationales for the review of proposed actions in wetlands and to some extent, subaqueous lands. However, at the time of publication, several shoreline practices commonly used today were not common and the Guidelines provide little, or no, rationale to address them (ie. marsh toe protection). The Guidelines do provide discussion on the limitations of certain shoreline erosion control options (ie. breakwaters), but the discussions are not presented in a comparative or relative sense of considering the entire range of shoreline options.

The Guidelines do contain several pertinent specific criteria that the WAG group considered in the development of the preferred order. Of the applicable criteria, one addresses a "break-point" or threshold in the degree of erosion and the use of a structure "for shorelines experiencing mild to moderate erosion, the planting of marsh grasses is a preferred means of stabilization" (Wetlands Guidelines, pg. 44). The other criterion specific to this discussion is "sloped rock or riprap revetments and gabions are generally preferred over vertical structures" (Wetlands Guidelines, pg. 45).

The Wetlands Program list of preferred shoreline management approaches is shown below. The list reflects current understanding of the ecological and physical processes of shorelines. We developed four general categories of approach; 1) no action, 2) non-structural techniques, 3) combined non-structural and structural techniques, and 4) structural techniques. The consensus opinion of the WAG is that the least, or non-invasive, approach is preferred. Techniques that involve structures, but incorporate creation of ecological functions through aquatic and/or terrestrial habitat, are preferred to the use of structures alone. The rationale for this perspective originates from the perspective that erosion is a natural process that provides sediment for beaches and marshes, and that naturally occurring shoreline conditions are best suited to provide ecologic services and adapt to anthropogenic and non-anthropogenic changes.

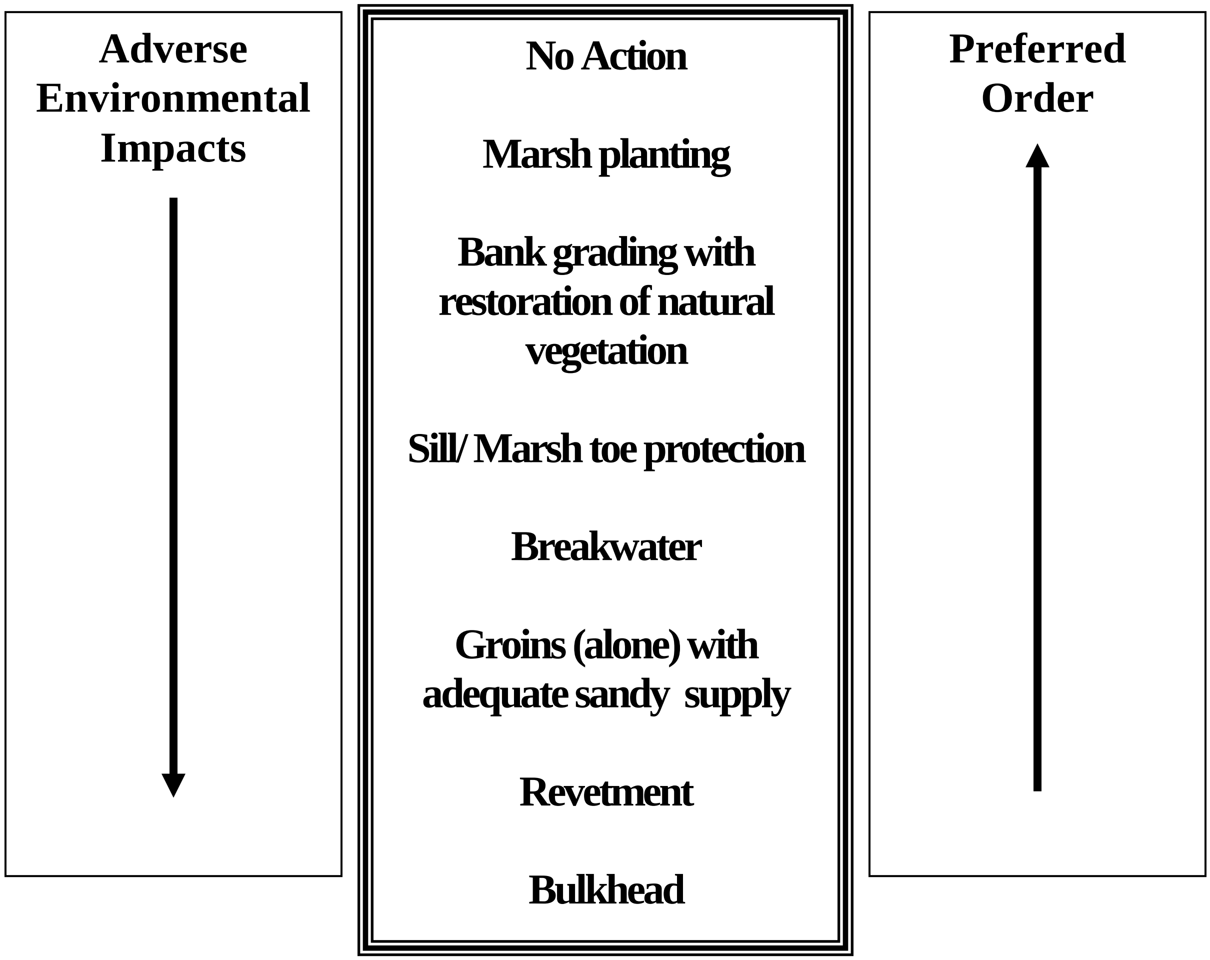

Figure 1. Preferred Order for Shoreline Approaches

No Action
The preferred approach is to take no action and leave the shoreline in the existing or natural condition. The Guidelines state that action should only be considered if there is active, detrimental erosion or to protect property from significant damage or loss due to erosion or other natural causes. Absent indicators of erosion such as; eroding banks, undercut banks, slip slopes, exposed tree roots, shoreline modification is considered unnecessary.

Non-structural Techniques
<u>Marsh planting</u>
According to the Wetlands Guidelines for minor to moderate erosion, marsh planting is a preferred means of stabilization. This technique may be used to augment existing sparse, or spotty vegetation, or establish newly vegetated shorelines. Marsh planting for

shoreline protection involves vegetating, or re-vegetating appropriate elevations to establish marsh for shoreline protection. This option may include modifications to the substrate in order to provide the proper conditions for the vegetation. Marsh vegetation requires mostly sun to full sun conditions to thrive. A shaded shoreline would require modification to the trees and/or shrubs (removal or trimming) to provide adequate light. Hardaway and Byrne (1999) place the upward limit on fetch at ½ a nautical mile on the use of marsh planting for erosion protection absent any additional structural elements.

Bank grading with vegetation

Marsh establishment without modification to the bank may not always be an option. For minor to moderate erosion shorelines with unstable banks, it may be possible to stabilize the bank by grading the bank to a more stable slope. The bank grading approach is useful to address unstable banks where the perceived problem is erosion, specifically tidal erosion, but is actually upland runoff. The bank grading option is a nonstructural choice that actually allows for the creation of new shoreline buffers in the form of riparian and/or wetland vegetation. If there is some tidal erosion at the base of the bank, bank grading may also incorporate relocation of the base landward and creation of a flat slope to protect the base of the newly sloped bank. The slope may be at appropriate elevations to plant with marsh.

Combined techniques: Structural and Non-structural

This category includes those approaches designed with structural elements intended to protect, or create, shoreline habitats for the purpose of using the shoreline habitats/ structure system as protection.

Marsh toe protection

Sill and marsh toe protection are two common terms for structures that are functionally very similar and used in similar shoreline settings. The sill/marsh toe protection is a low shore- parallel structure placed channelward of an eroding marsh face, or used to contain emplaced material to be vegetated. Marsh toe protection is the commonly used term to describe a structure employed to protect or create a wetland, thus using the wetland to provide erosion protection generally through wave attenuation. A sill is the term sometimes used to describe a structure placed where there is no marsh, but one may be planned or expected to establish as a result of the structure. A marsh toe is generally needed for marsh creation projects where fetch is > ½ nautical mile.

Breakwaters

Breakwaters are offshore, shore parallel structures that function by both intercepting and dissipating waves prior to reaching the shore and by placing physical distance between the water and fastland. A breakwater acts two ways to protect the shoreline; 1) dissipates (breaks) wave energy and 2) changes the angle of the incident waves to reduce long-shore movement of the sandy material that comprises the beach portion of the breakwater system. Existing or supplied, sandy material is used to create a beach between the breakwaters and the area to be protected. Breakwaters are suited for high-energy shorelines with sandy substrate. Breakwaters are permanent structures that result in the loss and conversion of certain marine habitats. However, they can be associated with wetland and/or beach vegetation and these systems do allow for some connectivity across the shoreline gradient.

Groins

Groins are shore normal linear structures intended to trap sand to build a beach. The beach, not the groin, provides the work of erosion protection. The groins, themselves, do not enhance and can actually impede erosion protection. Groins trap sediment moving along the shoreline resulting in the loss of beach on the downdrift side of the groin. Groins also may act to deflect the direction of incident waves and direct the energy toward the shoreline. This may result in the erosion of the adjacent bank and beach. The use of groins should be limited to areas with adequate sand supply and nourishment is recommended.

Structural Techniques

Revetments and Bulkheads

The most environmentally detrimental choices for shoreline protection are those structures built shore parallel, onshore, and that completely sever the connection across the shore gradient, namely revetments and bulkheads. Of the two, revetments are already stated as preferred to bulkheads in the Wetlands Guidelines (See pages 45-46 for an explanation of the rationale for that preference). Scientific understanding of the ramifications of hardened shorelines on the marine environment and the aquatic-terrestrial interface is limited. Current investigations on benthic and finfish community responses to various shoreline structures should provide additional rationale for the appropriateness of their use.

Preferred Order of Protection for Shoreline habitats

The rationale for the preferred order of protection for shoreline habitats largely focuses on water quality functions. Nutrients and sediments unquestionably are the primary agents responsible for estuarine water quality impairment in Virginia.

Sediment and nutrients enter Bay waters through various non-point source pollution vectors. During rain events, surface runoff transports water and nutrients and discharges to the waterway. The introduction of nutrients and sediments from overland flow does not have one discharge point but may occur over the entire length of the receiving water.

The Chesapeake Bay Program Sediment Workgroup, a panel of regional experts in sediment processes, recently compiled a summary document that was published by the US Geological Survey in 2003. That publication identified shoreline and the associated near shore erosion as the primary source of sediment to the overall Bay system, contributing 57% of the total identifiable sediment sources with 43% from non-tidal sources (Langland and Cronin, 2003).

Tidal erosion is the combination of both fastland erosion and nearshore erosion. Fastland is land above tidal water, often called shoreline, and nearshore is the shallow water close to shoreline. The ACOE Shore Erosion Study in 1986 estimated that of the total sediment delivered to the Bay by tidal erosion, near shore erosion contributed 57% and fastland erosion 43% (US COE, 1986).

In addition to overland run-off and bank and near-shore erosion, groundwater discharge is a source of nutrients to Bay waters. Documentation for this source of pollutants is sparse. Available data indicates a great degree of site-specificity in the contribution of nutrients to Virginia's waters (Stanhope, 2003).

In summary, the vectors of sediment and nutrients are:

Overland run-off:	Sediment and Nutrients
Groundwater:	Nutrients
Bank erosion:	Sediment
Tidal waters:	Sediment and nutrients

The capacity for a shoreline habitat to act to improve water quality depends upon many factors. Two very important factors are the relative physical location to the pollutant vector and plant morphology and physiology. Based upon relative location and plant community structure, the capacity to improve or prevent degradation of water quality can be described.

Table 1: Scoring Habitat Water Quality Benefit

Habitat	Overland Flow	Groundwater	Bank Erosion	Tidal Flow	Total
Wetland >16 feet	Some	Some	Yes[1]	Yes[2]	10
Riparian Mixed Strata	Yes[3,4]	Yes[5]	Some	No	8
Wetland < 16 feet	Some	No	Some[1]	Yes[2]	7
Riparian Single tree line	Some	Some	Some	No	6
Lawn	Little	No	No	No	1

Numeric Values for scoring: Yes=3, Some=2, Little=1, No=0

The likelihood of the habitats to mitigate for the pollutant vectors and provide water quality benefit is described in Table 2. While there is scientific documentation to support some of the values in the table, other values are based on opportunity as determined by best professional judgment. Also, the levels are relative and do not reflect any quantified pollutant loads.

Scientific evidence indicates that there is almost 90% loss of wave energy for a cordgrass marsh with a width of 32 feet and a 70% loss for a 16foot marsh and a 60% loss for an 8foot marsh (Knutson, et.al, 1982). [1]

A study of the removal of suspended sediments from overmarsh tidal flows by *Spartina* and *Phragmites* shows total suspended sediment concentrations on the marsh significantly lower than adjacent, non-vegetated areas (Leonard, et al., 2002). [2]
Riparian forests have been found to be effective filters for nutrients, including nitrogen, phosphorus, calcium, potassium, sulfur, and magnesium (Lowrance and others 1984a, 1984b). [3]

Scientists estimated that 84 percent to 90 percent of the sediment from cultivated agricultural fields was trapped in an adjoining deciduous hardwood riparian area (Cooper and others 1987). Sand was deposited along the edge of the riparian forest, while silt and clay were deposited further in the forest. [4]

Nutrients can enter surface waters in subsurface or surface flows (as a dissolved form or attached to soil particles). For example, nitrogen is most commonly transported as dissolved nitrogen through subsurface flows, with peak nitrate levels occurring during the dormant season after crops have been harvested and soil evaporation rates are reduced. In contrast, phosphorus most often enters the stream adsorbed into soil particles and organic materials in surface runoff after storm events. (Klapproth and Johnson 2000). [5]

Riparian areas can be important sinks for phosphorus; however, they are generally less effective in removing phosphorus than either sediment or nitrogen (Parsons and others 1994). [6]

Figure 2. Preferred Protection for Shoreline Habitats

Preferred Protection ↑

Vegetated Wetlands greater than 16 feet (width)

Mixed-strata/ forested riparian area (natural condition)

Vegetated Wetlands less than 16 feet (width)

Single line of trees

Nonvegetated wetlands

Lawn

The group also discussed the development of a rationale based on habitat. The group agreed that such a finding was difficult to defend even on the most general scientific principles due to the disparate nature of the terrestrial and aquatic faunal communities. With regard to habitat, there was no valid ecological argument regarding the preservation, or impact, of one habitat type over another at this time.

Specific Scenarios

After identification of elements considered in the permit review process, we ranked the elements in order of those thought to be most influential on VIMS opinion regarding the need for action and the approach that is preferred. The consensus of the group was that two factors were the most important: bank stability and erosive condition. Bank stability is perhaps easier to observe as indicated by conditions such as less vertical slopes, presence of vegetation on the slope. Erosive condition, influenced by shoreline orientation, fetch, nearshore bathymetry, prevailing winds and soil erosivity, is not readily observed.

Generally, shorelines with stable banks and associated wetlands do not require action. Where the bank is unstable, the condition may not be caused by tidal borne energy entirely, or at all. Addressing an unstable bank with the least adverse environmental impact is likely to require that the solution be positioned in the landscape to address the source of the problem; which may not be on the shoreline. Many low energy shorelines, with a fetch less than ½ mile, have stable banks. Where there is indication of an erosion problem on a low energy shoreline, the site may be suitable for marsh creation. Some typical low and moderate energy shorelines are shown below.

No-Action

Riparian condition:	vegetated
Bank stability:	no slumping, no exposed roots, vegetated
Bank Slope:	low
Wetland habit:	vegetated

Marsh planting

Bank stability:	no slumping, no exposed roots
Bank slope:	low
Wetland habit:	non-vegetated patches or non-vegetated
Shoreline fetch	less than 0.5 nautical miles
Riparian condition:	open; minimal shading

Marsh toe protection

Bank stability:	bank, here described as marsh scarp, eroding
Wetland habit:	vegetated
Shoreline fetch	less than 1.0 nautical miles

Marsh toe protection with marsh planting

Bank Slope:	low, moderate
Wetland habit:	non-vegetated patches or non-vegetated, possible adjacent marsh
Shoreline fetch	less than 1.0 nautical mile

Bank grading with re-vegetation

Bank stability:	Unstable, eroding
Bank Slope:	low, moderate
Riparian habitat:	lawn, possibly sparse woody vegetation, or undeveloped entirely forested.
Wetland habit:	vegetated or non-vegetated
Shoreline fetch	less than 0.5 nautical miles

Erosion- Shoreline Change Matrix

Originally not specified as a product of the current grant, the meetings on the consensus project created an opportunity to produce a value-added benefit in the exploration of options to better provide and serve information on shoreline issues. One outcome of the effort was the creation of a theoretical matrix using erosion and shoreline change as indicators of the need for action and the preferred actions. The decision matrix could generate a "first-cut" presumed preferred approach using some existing information, but mostly information proposed for development. The idea was that the determination of the need for action and the assessment of options for actions were fundamentally related to the erosion and recession of the shoreline (bank stability and erosive forces).

Table 2. Shoreline Decision Matrix: Erosion and Shoreline Change

Shoreline Change/ Recession	**L**	**L**	**H**	**H**
Integrated Erosion	**L**	**H**	**L**	**H**
Initial Assessment	**No Action/ Living Shoreline**	**Living Shoreline**	**Living Shoreline/ Structure**	**Structure**

Legend:
Living Shoreline = marsh, marsh with toe revetment, bank grading w/ vegetation
Structure= breakwater, groins, revetment, bulkhead

The matrix above is based on the availability of a proposed Virginia Shoreline Classification System. The exposure value is a model comprised of fetch, compass rose (orientation) and bathymetry. The recession value would be determined from an analysis of shoreline change using a methodology such as that proposed in Berman, 2004. In *The Virginia shoreline classification – Part 1*, Berman *et al.* reviewed available approaches for the analysis of shoreline change. A test study to develop the recession rates was performed by the Comprehensive Costal Inventory in 2004. The advantages and disadvantages of the various approaches led to the report finding that the recommended approach for Virginia would be to employ methods similar to those used in Maryland. The report also found that the development of this dataset for Virginia would not be a trivial task and is anticipated to be time-consuming and relatively costly. The benefit of these datasets however is also not trivial. A shoreline classification system would be greatly beneficial in the development of shoreline management plans for larger reaches of shoreline minimizing the typically instituted piece-meal approach. While the recession data would allow for the theoretical matrix above to be populated, put into a ARCGIS project and used to generate a "first-cut" shoreline review from the WAG, the information could be incorporated into many coastal resource decision-making processes including; natural resource preservation and restoration, residential development, infrastructure planning, commercial maritime development, and coastal hazards assessments.

The other element of the matrix that has yet to be developed is the integrated erosion value. This element is a quantitative value comprised of four different factors to give a relative erosion value for the shoreline. The factors are; fetch, orientation, compass rose, and bathymetry. The erosion value may be used in concert with shoreline recession to assess the necessity for shoreline protection. The shoreline management options for shorelines that have experienced no landward displacement but have some indication of erosion are likely to be different from those options for a receding shoreline with evidence of erosion.

Absent the availability of long-term recession and an integrated erosion value, fetch can be used as a surrogate. Fetch is one parameter that would be incorporated into the integrated erosion value, and may be the most indicative of over-all erosion risk. According to Hardaway and Byrne, 1999, low energy shorelines have a fetch of up to one nautical mile, medium energy shoreline have a fetch of one to 5 nautical miles, and high energy shoreline have a fetch greater than 5 nautical miles.

Conclusions

This report represents the VIMS consensus regarding the most appropriate use and placement relative to shoreline habitats of shoreline erosion control approaches. Recognizing that the preferences are not prescriptive and that erosion control approaches are not universally interchangeable, the role of best professional judgment remains an important part of VIMS role in the permit review process. The outcome of the VIMS consensus effort nevertheless will be reflected in the permit review process. From the VIMS perspective, next steps in the continued development of a Virginia perspective on shoreline management requires that the consensus be built into the decision-making criteria guidance used in the review of permit applications. Analogous to the Wetlands Guidelines, enhanced technical guidance would have an expanded scope based on current scientific understanding of the shoreline ecosystem (shallow water, wetlands and riparian lands) along with comprehensive criteria. VIMS has proposed to produce this technical guidance. The other steps include supporting and participating in the evolution of a Virginia perspective on shoreline management. For this process, the contents of this report may serve as a springboard to advance the discussion among the various entities involved in the management of Virginias' shoreline.

Participating Individuals

The following individuals participated in discussions that generated the outcomes reported in this document:

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Citations

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Appendix A

Comprehensive Coastal Inventory Tables

Tier One - Riparian Land Use Classes

Forest	stands greater than 18 feet / width greater than 30 feet
Scrub-shrub	stands less than 18 feet
Grass	includes grass fields and pasture land
Agriculture	includes cropland
Residential	includes single or multi family dwellings
Commercial	includes small business, recreational facilities
Industrial	includes large facilities
Bare	lot cleared to bare soil
Timbered	clear-cuts
Paved	hard surface: parking lots, roads
Unknown	land use undetectable from the vessel

Tier 2 - Bank Conditions

Bank Attribute	Range	Description
bank height	0-5 ft	from the toe to the edge of the fastland
	5-10 ft	from the toe to the edge of the fastland
	10-30 ft	from the toe to the edge of the fastland
	> 30 ft	from the toe to the edge of the fastland
bank stability	low erosion	minimal erosion on bank face or toe
	high erosion	includes slumping, scarps, exposed roots
bank cover	total	>75% cover
	partial	25%-75% cover
	bare	<25% cover
marsh buffer	no	no marsh vegetation along the bank toe
	yes	fringe or pocket marsh present at bank toe
Phragmites australis	present	
marsh stability	stable	no obvious signs of erosion
	unstable	marsh edge is eroding or vegetation loss
beach buffer	no	no sand beach present
	yes	sand beach present
beach stability	stable	accreting beach

	unstable	eroding beach or non emergent at low tide

Tier 3 - Shoreline Features

Feature	**Feature Type**	**Comments**
Control Structures		
riprap	L	
bulkhead	L	
breakwaters	L	first and last of a series is surveyed
groinfield	L	first and last of a series is surveyed
debris	L	can include tires, rubble, bricks, etc
unconventional	L	can include sandbags, culverts, etc
jetties	P	
Recreational Structures		
pier/wharf	P	includes private and public
boat ramp	P	denotes private or public
boat house	P	all covered structures, assumes a pier
marina	L	includes piers, bulkheads, wharfs,
#slips		

(Berman, 2003).